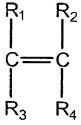
What is claimed:

1. A photoresist monomer represented by the following Chemical Formula 1:

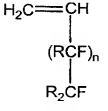
Chemical Formula 1



wherein, R_1, R_2, R_3 and R_4 individually are a hydrogen or a halogen-substituted alkyl; and wherein at least one of R_1, R_2, R_3 and R_4 is a halogen-substituted alkyl.

2. A photoresist monomer according to claim 1, which has a structure of the following Chemical Formula 2:

Chemical Formula 2

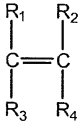


wherein, R is H or F; and n is an integer ranging from 1 to 5.

3. A photoresist monomer according to claim 2, wherein the monomer is 3,3,4,4,5,5,6,6,6-nonafluoro-1-hexene.

4. A photoresist polymer comprising a monomer represented by the following Chemical Formula 1:

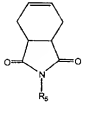
Chemical Formula 1



wherein R_1, R_2, R_3 and R_4 individually are a hydrogen or a halogen-substituted alkyl; and wherein at least one of R_1, R_2, R_3 and R_4 is a halogen-substituted alkyl.

5. A photoresist polymer according to claim 4, which further comprises the compound represented by the following Chemical Formula 3:

Chemical Formula 3

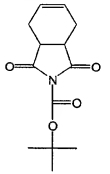


wherein R_5 is COOR'; and R' is an acid labile protecting group.

6. A photoresist polymer according to claim 5, wherein the acid labile protecting group is selected from the group consisting of t-butyl, tetrahydropyran-2-yl, 2-methyl tetrahydropyran-2-yl, tetrahydrofuran-2-yl, 2-methyl tetrahydrofuran-2-yl, 1-methoxypropyl, 1-methoxy-1-methylethyl, 1-ethoxypropyl, 1-ethoxy-1-methylethyl, 1-methoxyethyl, 1-ethoxyethyl, t-butoxyethyl, 1-isobutoxyethyl and 2-acetylmenth-1-yl.

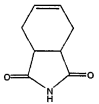
7. A photoresist polymer according to claim 5, wherein the compound of Chemical Formula 3 is the compound represented by the following Chemical Formula 3a:

Chemical Formula 3a



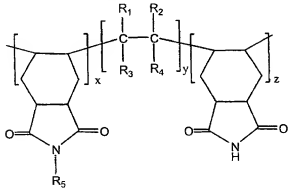
8. A photoresist polymer according to claim 4, which further comprises the compound represented by the following Chemical Formula 4:

Chemical Formula 4



9. A photoresist polymer comprising a repeating unit represented by the Chemical Formula 5:

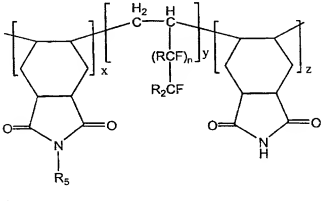
Chemical Formula 5



wherein, R_1, R_2, R_3 and R_4 individually are a hydrogen or a halogen-substituted alkyl; and wherein at least one of R_1, R_2, R_3 and R_4 is a halogen-substituted alkyl; R_5 is COOR'; R' is an acid labile protecting group; and the mol% ratio x : y : z falls within the following ranges: 0 to about 40 mol% : 20 to about 40 mol% : 0 to about 50 mol%.

10. A photoresist polymer according to claim 9, wherein the polymerization repeating unit of the Chemical Formula 5 is represented by the following Chemical Formula 6:

Chemical Formula 6



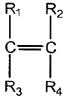
wherein, R is H or F; R_5 is COOR'; R' is an acid labile protecting group; n is an integer from 1 to 5; and the mol% ratio x : y : z falls within the following ranges: 0 to about 40 mol% : 20 to about 40 mol% : 0 to about 50 mol%.

11. A process for preparing a repeating unit of a photoresist polymer of claim 9, comprising:

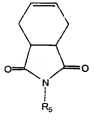
(a) admixing (i) the compound of Chemical Formula 1, and (ii) at least one of the compound of following Chemical Formula 3 and Chemical Formula 4; and

(b) adding a polymerization initiator and a metal catalyst into the resultant to perform a polymerization initiator, thereby obtaining the repeating unit of Chemical Formula 5:

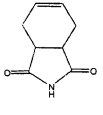
Chemical Formula 1



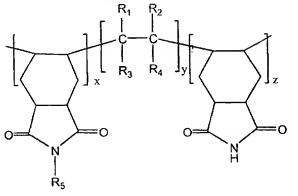
Chemical Formula 3



Chemical Formula 4



Chemical Formula 5



wherein, R_1, R_2, R_3 and R_4 are individually a hydrogen or a halogen-substituted alkyl; wherein at least one of R_1, R_2, R_3 and R_4 is a halogen-substituted alkyl; R_5 is COOR'; R' is an acid labile protecting group; and x, y and z are polymerization ratios.

12. The process according to claim 11, wherein the mol% ratio x : y : z of Chemical Formula 5 falls within the following ranges: 0 to about 40 mol% : 20 to about 40 mol% : 0 to about 50 mol%.

13. The process according to claim 11, wherein the mol% ratio x : y : z of Chemical Formula 5 falls within the following ranges: 20 to about 40 mol% : 20 to about 40 mol% : 20 to about 50 mol%.

14. The process according to claim 11, wherein the step (a) is carried out in a polymerization solvent selected from the group consisting of tetrahydrofuran, dimethylformamide, dimethylsulfoxide, dioxane, benzene, toluene, xylene, propylene glycol methyl ether acetate and mixtures thereof.

15. The process according to claim 11, wherein the metal catalyst is allylpalladium chloride dimmer $[(allyl_3PdCl_2)_2]$ as an organometallic catalyst.

16. The process according to claim 11, wherein the metal catalyst is silver hexafluoroantimonate ($AgSbF_6$) as an inorganic metal catalyst.

17. The process according to claim 11, wherein the metal catalyst is single or mixed catalyst selected from the group consisting of palladium ethylhexanoate, palladium (II) bis(trifluoroacetate), palladium (II) bis(acetylacetonate), palladium (II) 2-ethylhexanoate, palladium (II) bromide, palladium (II) chloride, palladium (II) iodide, monoacetonitriletris(triphenylphosphine)palladium (II) tetrafluoroborate, tetrakis(acetonitrile)palladium (II) tetrafluoroborate, dichlorobis(acetonitrile)palladium (II), dichlorobis(triphenylphosphine)palladium (II), dichloro(benzonitrile)palladium (II), palladium acetylacetonate, palladium bis(acetonitrile)dichloride, palladium bis(dimethylsulfoxide)dichloride, nickel ethylhexanoate, nickel carboxylate, nickel diketylglyoxime, nickel ethylacetyl hexanoate and bis(allyl)nickel.

18. A photoresist composition comprising (i) a photoresist polymer of claim 4; (ii) a photoacid generator; and (iii) an organic solvent.

19. The photoresist composition according to claim 18, wherein the photoacid generator is selected from the group consisting of phthalimidotrifluoromethane sulfonate, dinitrobenzyl tosylate, n-decyl disulfone and naphthyl imido trifluoromethanesulfonate.

20. The photoresist composition according to claim 18, wherein the photoacid generator further comprises one or more compound(s) selected from the group consisting of diphenyl iodide hexafluorophosphate, diphenyliodide hexafluoroarsenate, diphenyliodide hexafluoroantimonate, diphenyl-p-methoxyphenyl triflate, diphenyl-p-toluenyl triflate, diphenyl-p-isobutylphenyl triflate, triphenylsulfonium hexafluoroarsenate, triphenylsulfonium hexafluoroantimonate, triphenylsulfonium triflate and dibutylnaphthylsulfonium triflate.

21. The photoresist composition according to claim 18, wherein the photoacid generator is used in an amount ranging from about 0.05 to about 10 % by weight of the photoresist polymer.

22. The photoresist composition according to claim 18, wherein the organic solvent is selected from the group consisting of diethyleneglycol diethyl ether, ethyl 3-ethoxypropionate, methyl 3-methoxypropionate, cyclohexanone, propyleneglycol methyl ether acetate, n-heptanone, ethyl lactate, cyclopentanone and mixtures thereof.

23. The photoresist composition according to claim 18, wherein the organic solvent is used in an amount ranging from about 500 to about 2000 % by weight of said photoresist polymer.

24. A process for formation of a photoresist pattern, comprising:

(a) coating the photoresist composition of claim 18 on a substrate to form a photoresist film;

(b) exposing the photoresist film to light; and

(c) developing the photoresist film.

25. The process according to claim 24, further comprising a soft baking step before step (b) and/or a post baking step after step (b).

26. The process according to claim 25, wherein the soft and post baking steps are performed at the temperature ranging from about 70 to about 200°C.

27. The process according to claim 24, wherein the source of light is selected from the group consisting of KrF, ArF, E-beam, VUV, EUV and ion beam.

28. A semiconductor element manufactured according to the process of claim 24.